

REMARKS

Claims 1-8 were presented and examined. In response to the Office Action, Claims 1 and 8 are amended and Claim 9 is added. Reconsideration of pending Claims 1-9 is respectfully requested in view of the above amendments and the following remarks.

I. Claims Rejected Under 35 U.S.C. § 103(a)

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,522,055 to Uemura et al. (“Uemera,” previously cited as Publication 2001/0028209) in view of U.S. Patent 7,064,474 to Liu et al (“Liu,” previously cited as Publication 2004/0095050).

Claim 1 is amended to recite the features of forming a “fluffy film” and “forming a surface of the fluffy film with a uniform height from the substrate.” The former feature is supported in the specification at page 8, lines 23-24 and page 9, line 2. The latter feature is also supported in the specification at page 11, lines 4-5 and page 12, lines 12-13.

The Examiner recognizes that Uemera fails to disclose the use of irradiation on a carbon nanotube film, but relies on Liu for supplying the missing elements. In Liu, before and after laser beam irradiation, the carbon nanotubes (CNTs), which include a plurality of lower portions 121 and a plurality of corresponding tapered tips, are formed on the substrate 11 substantially perpendicularly to the substrate (see Col. 3, lines 10-14 and Col. 4). Therefore, the laser beam impinging on the substrate 11 perpendicularly thereto acts to burn the wholly flat distal ends of the tips, as shown in FIG 3, to form the tapered tips 122. Since the direction of the laser beam irradiation is parallel to the direction of the CNT growth, the lower portions 121 of the CNTs will not be severed or disconnected by the laser beam.

In contrast, according to the claimed invention, a fluffy film containing curled and entangled CNTs (fluffy CNT film) is formed on the substrate. Consequently, when irradiating the substrate with the laser beam perpendicularly to the substrate, the CNTs will have their curled portions cut off or disconnected, such that each CNT is (longitudinally) divided into a plurality of CNTs. In the claimed invention, the curled portions of the CNTs are burned because the curled and entangled CNTs forming the fluffy CNT film extend in all directions on the substrate. Therefore, the CNT portions, which are in the vicinity of the surface of the fluffy CNT film and extend in directions substantially parallel with the substrate (namely, directions perpendicular to the direction of laser beam irradiation), undergo severances. As more CNTs are severed to

increase the number of CNTs, the free ends of the CNTs functioning as emission sites also increase accordingly.

For at least the foregoing reasons, Uemura in view of Liu does not teach or suggest the operation of “irradiating the fluffy CNT film with a laser beam perpendicularly thereto,” as recited in Claim 1. Neither Uemura nor Liu teaches or suggests associating a fluffy CNT film with laser beam irradiation. Thus, neither Uemura nor Liu teaches irradiating the fluffy CNT film with a laser beam perpendicularly thereto to increase the emission sites.

In addition, Liu irradiates the substrate with a laser beam for the purpose of forming the tapered tips 122. As a result, in Liu, the film formed on the substrate does not have an even surface. In contrast, Claim 1 recites a fluffy CNT film irradiated with a laser beam perpendicularly thereto in order to provide the fluffy film with a surface having a uniform height from the substrate. Neither Uemura nor Liu teaches or suggests forming a surface having a uniform height from the substrate by the laser beam.

Furthermore, according to the Office Action, it would have been obvious to one of ordinary skill in the art to combine Uemura and Liu for the reason that the irradiation by laser beam could contribute to a decreased threshold voltage required for field emission by the CNT (see Office Action, page 4, lines 16-22). However, there exist numerous possible approaches to decreasing the threshold voltage required for field emission by the CNT. Finding a workable approach would have required undue experimentation for a person of ordinary skill in the art. Neither reference teaches or suggests that a fluffy film can be irradiated to increase the number of free ends or to form a surface having a uniform height from the substrate. Combining the irradiation of Liu with the coating film of Uemura is hindsight reconstruction.

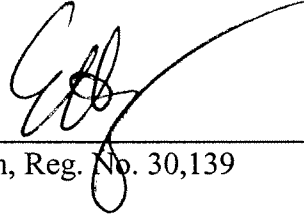
For at least the foregoing reasons, Uemura in view of Liu does not teach or suggest each of the elements of Claim 1, as well as its dependent claims, namely, Claims 2-7. Analogous discussions apply to independent Claims 8 and 9. Accordingly, Applicants respectfully request that the § 103 rejection of Claims 1-8 be withdrawn, and new Claim 9 be allowed.

CONCLUSION

In view of the foregoing, it is believed that all claims are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP



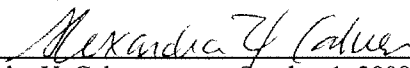
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